A GEOLOGICAL INVESTIGATION OF THE OFFSHORE AREAS ALONG FLORIDA'S CENTRAL EAST COAST

ANNUAL REPORT TO
the
UNITED STATES DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE
YEAR 3

PART 1

Contract Period January 1, 1998 through February 15, 1999
Cooperative Agreement No. 38-0001-30757

Henry Freedenberg, P.G. #617 and Ron Hoenstine, P.G. #57
Principal Investigators
Adel Dabous, Brian Cross, Allen Willett, Michelle LaChance
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A Geological Investigation of the Offshore Area along Florida's Central East Coast

Annual Report to the United State Department of the Interior Minerals Management Service-Year 3

Introduction

The Minerals Management Service of the U.S. Department of the Interior (MMS) and the Florida Geological Survey have entered into a multi-year cooperative agreement (Cooperative Agreement # 14-35-0001-330757 / State of Florida Organization Code 3705 0204 679) with the goal of characterizing the beach nourishment potential of sands found in Federal waters off the east coast of Florida. This includes Federal waters out to eight miles offshore of southern Brevard, Indian River, St. Lucie and Martin Counties. Figure 1 displays the area of investigation for this agreement.

Year 1 tasks included the compilation of an annotated bibliography describing previously completed work in the study area, along with the initiation of an onshore push-core program to establish a baseline characterization of beach sands in the study area. Results of tasks completed during Year 1 of this investigation are summarized *in "A Geological Investigation of the Offshore Area Along Florida's Central East Coast, Annual Report to the MMS-Year 1"* (Hoenstine et al., 1995), delivered to the MMS during October 1995. FGS Open File Report #69, *"A Geological Investigation of the Offshore Area Along Florida's Central East Coast, Year 1"* (Freedenberg et al., 1995) also summarizes Year 1 results of this investigation. During October 1995, an interim report, *"A Geological Investigation of the Offshore Area Along Florida's Central East Coast, Interim Report to the U.S. Department of the Interior, Minerals Management Service"* Freedenberg et al., 1995) described a bottom sediment grab sampling program which was conducted in Federal waters in the northern part of the study area.

Year 2 activities were summarized in *"Annual Report to the U.S. Department of the Interior Minerals Management Service Year 2, A Geological Investigation of the Offshore area along Florida's Central East Coast"* (Freedenberg et al., 1997). Year 2 tasks included the collection, description and analysis of additional push cores in southern Brevard County. Push cores were also collected in Indian River County. More than 500 line miles of subsurface acoustic profile data were collected in Federal waters off of southern Brevard County. These data were reprocessed and interpreted. A grab sampling program was also initiated. Bottom sediment grab samples were collected and analyzed. Grab sample locations were chosen based on interpretation of the seismic data. Results of the grab sample analyses were used to pick sampling locations for a follow-on vibracore program.

Year 3 activities are summarized in this report. This document is being delivered as Part 1 and Part 2. Part 1 serves as an executive summary detailing tasks accomplished and summarizing analytical results. Part 2 of this document consists of Appendices containing the supporting data collected during year 3 of this study.

Year 3 Scope of Work

Year 3 tasks commenced with the lithologic description and granulometric analyses of ten Indian River County push cores collected during the previous years' field work. Five additional push cores were collected in St. Lucie County and three additional push cores were acquired in Martin County. Lithologic descriptions and granulometric analyses of all push cores were completed. Approximately 330 miles of subsurface acoustic profile data were collected in Federal waters off of Indian River, St. Lucie and Martin Counties. These data were reprocessed and a preliminary interpretation has been completed, with the aim of locating areas favorable for sand accumulation.

Ten vibracores were collected in Federal waters off of Brevard County. Lithologic descriptions were compiled for each vibracore and granulometric analyses were completed.

Push Core Program

During years 1 and 2 of this study, a total of 17 vibracores were collected in Brevard County. Ten additional vibracores were collected in Indian River County during year 2, for a total of 14 Indian River County cores. These cores were not described or analyzed in time for inclusion in the Year 2 Annual Report. Year 3 tasks included the description and analyses of these ten Indian River cores. Five additional push cores were collected in St. Lucie County (9 total) and 3 additional cores were collected in Martin County (6 total). Additional push cores may be collected in the future from an area north of Hobe Sound in Martin County. Lack of roads restricts onshore access to this area.

As with previously collected cores, the cores collected during this year's work will be used to establish a baseline characterization of beach sediments. All push cores were driven to a depth of ten feet below ground surface or until refusal. All cores were split lengthwise, described lithologically and sampled for granulometric analyses. A GPS receiver was used to record the lat-long coordinates of all sampling locations. Figure 2 displays the locations of all cores collected in the study area during both the present and earlier phases of this study. Lat-long coordinates and acquisition dates for all push cores are given in Table 1. Lithologic descriptions of the previously undescribed push cores in Indian River, St. Lucie and Martin Counties are summarized in Appendix A, while the results of granulometric analyses of these cores are displayed in Appendix B. Photographs of push core sediments are included as Fig. 5.

Subsurface Acoustic Profiling

More than 330 line miles of subsurface acoustic profile data were acquired during Year 3 of this study. All data were acquired in Federal waters off of Indian River, St. Lucie and Martin Counties. The seismic program consisted of 32, seven-mile-long, east-west (dip) lines, 15 shorter east-west lines and one north-south (strike) line (Fig. 3). The strike line was approximately 48 miles in length. During post-processing, it was discovered that the navigation data files associated with three of the seven-mile-long dip lines (SL-1, SL-3 and SI-31 off St. Lucie county) were corrupted. The navigation

data associated with SL-31 were recovered from the paper record. The geographic location of the data on lines SL-1 and SL-3 is uncertain. These two lines will be reshot during the next field season. The length of the shorter dip lines was determined by the location of the 100' water depth contour. At present, it is uneconomical to dredge fill material from water depths greater than 100'. Therefore, shooting was discontinued seaward of the 100' contour.

Most data were collected aboard the FGS chartered survey vessel "Jesse and Jenise." The Jesse and Jenise is a 40 foot long converted work platform based on a Key West #1 fiberglass hull. The boat is powered by a pair of Detroit Diesel 6-53 engines connected to twin screws. It is capable of making approximately 18-20 knots when lightly loaded in calm seas. The Jesse and Jenise is set up exclusively for daylight operation.

The physical configuration of the data acquisition equipment was identical to the configuration used during year 2. Signal energy for the survey was provided by a Huntec boomer sled towed approximately 20 feet behind the research vessel. A ten station ITI streamer cable was used for signal detection. In an effort to improve signal resolution and provide repetitive imaging of the same depth point, only signals from the five adjacent geophones closest to the research vessel were activated during this shooting program. The shooting geometry used in the current year acquisition program is identical to the geometry employed during year 2. Figure 4 from the year 2 report which displays shooting geometry is included as Figure 4 in this report.

The relative merits of analog versus digital data acquisition were discussed on pages 5-7 of the Year 2 annual report. This information should be reviewed as it is quite germane to the Year 3 report.

Significant changes were made in the shooting parameters of this year's survey. Signal amplitudes were digitally recorded at a rate of 8000 times per second for a record length of 200 milliseconds. This provided 1600 samples per shot record. Using an average boat speed of four knots and a 1 second shot interval, it can be calculated that the seafloor was imaged at consecutive depth imaging points of approximately 6.7 feet. These shooting parameters were chosen after review of the Year 2 survey which had a greater than optimal data density.

Grab Sampling

Grab sampling is an ongoing task to assist in determining vibracore placement as well as site characterization. This sampling will continue upon initiation of the Year 4 field season. Grab sample locations will be chosen based on the preliminary seismic interpretation. Also, most NOAA coastal charts post bottom lithology data at random intervals. These bottom characterizations provide a "de facto" data base of previously collected grab samples. These data, however, are of limited utility in that grain size distribution data and percentage of fines included in the sample is not readily available. During our grab sampling program, the FGS will attempt to collect samples from selected NOAA chart locations displaying favorable bottom lithologies.

Vibracore Collection and Analysis

On September 2, 1998 a Brevard County vibracore collection program was initiated using the "Atlantic Twin," a dedicated 90-foot catamaran survey vessel. Sea conditions were unfavorable on September 3 and the vibracoring program was completed on September 4. The Atlantic Twin is operated by Alpine Ocean Seismic. Ten 20-foot long vibracores were collected at locations based upon the Year 2 seismic and grab sampling programs. Table 2 provides a tabulation of the core collection locations. Core locations are also shown on Fig. 7.

Granulometric analyses of the 10 vibracores collected reveals that at least 5 of the cores contain sand suitable for use as beach restoration material under the guidelines promulgated in section 5J of the Florida Administrative Code (FAC) Chapter 62B-41.007. This rule stipulates that that restoration sand "...must be similar to that already existing on site in both coloration and grain size..."and "... in general, not contain greater than 5 percent fines (passing the #200 sieve) or gravel exclusive of shell material (retained by the #4 sieve) and be free of coarse gravel or cobbles." Informal conversations with Florida DEP's Beaches and Coastal Systems staff reveals that, on occasion, sands with as much as a 10% fine content may be deemed acceptable for beach restoration use. A #200 sieve opening will pass 3.75 phi grains while a #4 sieve opening will pass grains of -2.25 phi size.

Surficial sand thickness in the prospective vibracores ranges from 4 feet to more than 20 feet. In Vibracore VB-3, an 8 foot thick surficial sand accumulation is underlain by a 1-foot thick layer containing an elevated fines content. Beneath this mud layer, the beach-quality sand continues for the entire 20 foot length of the core (19 feet net sand).

Other vibracores showing promising sand accumulations are VB-1, collected on the south flank of Canaveral Shoal (20' net sand), VB-3 (8' net sand), VB-4 (4' net sand), VB-9 (8' net sand), and VB-10 (6' net sand). Table 2 summarizes vibracore location and the amount of net sand suitable for beach restoration. Appendix C contains lithologic logs for each vibracore and Appendix D contains vibracore granulometric analyses. Fig. 6 contains selected vibracore photographs.

It should be emphasized that the degree of lateral extent can't be firmly assigned to any of the sands found in this vibracoring program. In order to properly evaluate the suitability of these sands for beach restoration, an additional coring program should be undertaken to delineate lateral extent of the individual sand bodies. Once extent is determined, the economic viability of each individual sand body can be evaluated and environmental assessments can be carried out on those accumulations thought to show economic promise.

Figure 7 shows vibracore location, thickness of surficial sand and projected reserve potential for the surficial sands found in each of the vibracores. Reserve potential is highly speculative and is based on the assumption that the sand distribution is both continuous and homogenous.

Seismic Character as an Indicator of Sand Resource Potential

Locations for vibracores VB-1 through VB-6 along with VB-9 and VB-10 were chosen on the basis of sand quality in grab samples collected from locations that were chosen on the basis of seismic character. The choice of locations for vibracores VB7/1, VB7/2 and VB-8 were based solely on seismic character.

VB-1, collected on the flank of Canaveral Shoal, was found to contain 20 feet of beach-quality sand. The beach-quality sand in this core is probably connected to an outlying extension of Canaveral Shoal. This core was collected from a location nearer to proposed Brevard County restoration projects than the anticipated Canaveral Shoal borrow area. Additional vibracores should be collected to determine the limits of this sand deposit and to evaluate whether this deposit might serve as a more economical source of beach-quality restoration sand.

VB-3, collected on a topographic high overlying a buried onlap stratigraphic sequence, contained a total of 19 feet of beach-quality sand. A 1 foot thick layer of sand with an elevated content of fine grained material was found to exist 8' below the top of the core. This location has not been previously recognized as containing beach-quality sand. The sand deposit is newly located.

VB-4 was located on a seismic amplitude anomaly coincident with the flank of a topographic high and was found to contain 4 feet of beach-quality sand. This sand may exist as a previously unrecognized discrete accumulation. Alternatively, it may be associated with the sands found in VB-3. If this were the case, VB-4 sands could be viewed as a thinning edge of the VB-3 sand deposit. Additional vibracoring will be necessary in order to determine if the sands located in Vibracores VB-3 and VB-4 are connected.

VB-9, which contains 8 feet of surficial beach-quality sand, was located on the flank of a topographic high and was underlain by a near-surface seismic amplitude anomaly. The vibracore was collected seaward of the topographic high associated with Thomas Shoal. The sands located in this core may be associated with Thomas Shoal or they may exist as an independent, previously unrecognized sand body.

Vibracore VB-10 was drilled overlying a deeper seismic amplitude anomaly on the western flank of Thomas Shoal. Thomas Shoal has not been previously characterized as a source of beach-quality restoration sand.

Of the cores which failed to show beach-quality sand, VB-2, VB-6, VB-7/1 and VB-7/2 were collected from locations overlying a buried onlap sequence. The choice of locations for VB-5, VB-8 and VB-9 were based on the presence of seismic amplitude anomalies.

Given the small sample size, it is impossible to generalize as to the validity of various sand indicators. To date, though, the cores associated with predicted basal transgressive onlap sands do not seem to be promising. Best results seem to be obtained when a topographic high is combined with one of the other indicators. It is

anticipated that, as more experience is obtained, a scoring system will be set up to help optimize vibracore collection locations.

Interpretation of Year 3 Seismic Data off Indian River, St. Lucie and Martin Counties

Preliminary interpretation of the 330 miles of seismic data collected during the Year-3 filed season has been completed. An Executive Summary map has been prepared for the southern portion of the cooperative agreement study area and is included as Figure 9 of this report.

This map shows areas thought to hold significant potential for sand accumulation based on seismic character. Topographic highs are also indicated. It is believed that these highs are indicative of sand shoaling or reef (*Sabellarid* worm rock) development. A paleo-shelf edge dating back to one of the recent ice ages is also clearly identifiable in St. Lucie and Martin Counties. The location of this shelf edge has also been added to the summary map. It is possible that the area immediately seaward of this shelf edge might be a zone of sand accumulation.

Interpretation of data obtained during acquisition of this 330 mile seismic program is an ongoing effort and is essential to determining vibracore placement and for bottom sediment ground truthing. A final map will be produced highlighting areas considered favorable for sand development and the original seismic data will be placed in the public domain.

Preliminary Estimation of Sand Reserves

A classification scheme is being introduced in order to help quantify the sand reserves found. Reserves are assigned to one of 3 categories---proven, probable and potential.

Proven reserves are those reserves whose thickness and lateral extent have been fully determined through the use of vibracore and/or push cores.

Probable reserves are those reserves whose existence has been established through the use of vibracores, push cores and/or grab samples. Thickness and/or lateral extent has not been fully determined. These are reserves that could be viable if additional coring is done.

Potential reserves are those reserves hypothesized to exist on the basis of indirect evidence such as acoustic subsurface profile (seismic) character or sidescan sonar character. The presence of sand through direct sampling methods has not yet been confirmed. Potential reserves could be upgraded if additional sampling confirms the existence of sand and additional coring is done to determine the extent of sand.

The discussion of reserves in this report is limited to probable reserves in the northern portion of the study area.

The reserves found in VB-1 are assumed to be an extension of the Canaveral Shoal accumulation. The location of the vibracore is approximately 2 miles from the nearest portion of the COE's proposed Borrow Area II. This accumulation could extend for another 2 miles shoreward for a length of 4 miles. Using a 2:1 shape factor, the width of this accumulation could be 2 miles. A sand thickness of 20 feet is assigned to the entire feature. If these numbers reflect reality, this area could hold additional sand reserves of approximately 115 million cubic yards. Additional vibracores should be collected to determine the true extent of this accumulation.

VB-3 was found to contain 8 feet of beach quality surficial sand. Beneath this surficial layer lies a 1 foot interval with elevated fines content. The remaining 11 feet of the vibracore is made up of beach-quality sand (19 net feet of beach-quality sand). VB-4 was found to contain 4 feet of surficial beach-quality sand. The remainder of the core displayed an elevated fines content. In view of the proximity of these two vibracores, it can be hypothesized that they both test the same sand body. The vibracores are located seaward of Patrick Air Force Base and is not believed to be associated with the Space Coast Shoal accumulation. This deposit could extend for 4 square miles and have an average net thickness of 12 feet. If this were to be the case, reserves of 49.5 million cubic yards could be assigned to this accumulation. The areal extent of this feature should be confirmed with additional vibracoring.

Vibracores VB-9 and VB-10 were collected on the flank of Thomas Shoal. VB-9 contained 8 feet of beach-quality restoration sand while VB-10 contained 6 feet of beach quality restoration sand. We can arbitrarily assign a sand thickness of 7 feet to the entire shoal. The areal extent of the Thomas Shoal is approximately 12 miles by 3 miles. If these numbers are a reasonable estimate, we could assign reserves of approximately 260 million cubic yards to this feature. The areal extent of this feature should be confirmed with future vibracoring.

Summary and Conclusions

- In an effort to augment previous push core data, five additional ten-foot push cores were collected in St. Lucie County and three additional push cores were collected in Martin County. Lithologic descriptions were made of each push core and grain size distributions were determined.

- Lithologic descriptions were completed and grain size distributions were determined for ten previously collected push cores in Indian River County.

- More than 330 line miles of subsurface acoustic profile data were acquired. Preliminary interpretation of this data has been completed.

- Ten vibracores were collected off the northern portion of the study area. Five of these cores show beach-restoration quality sand.

- Preliminary sand reserve estimates have been completed. These estimates show that an additional 115 million cubic yards of restoration quality beach-quality sand could be associated with Canaveral Shoal, an additional 49.5 million cubic yards of beach-quality sand could be associated with an unnamed shoal seaward of Patrick AFB. Beach-quality sand was also discovered near Thomas Shoal. There could be 260 million cubic yards of sand associated with the Thomas Shoal feature. Additional vibracoring should be performed to confirm the magnitude and extent of these three sand accumulations. It should be emphasized that all sand reserve estimates are preliminary and are likely to change as additional work is accomplished. Project planning concerning the use of these reserves should not commence until the size of the sand accumulation is fully determined.

Acknowledgments

The authors are indebted to the St. Petersburg, Florida, office of the United States Geological Survey for assistance in the acquisition and processing of subsurface acoustic profile data. Jack Kindinger and Dana Wiese provided generous assistance. Thanks are also extended to the staff of the FGS for their review and suggestions during preparation of this report.

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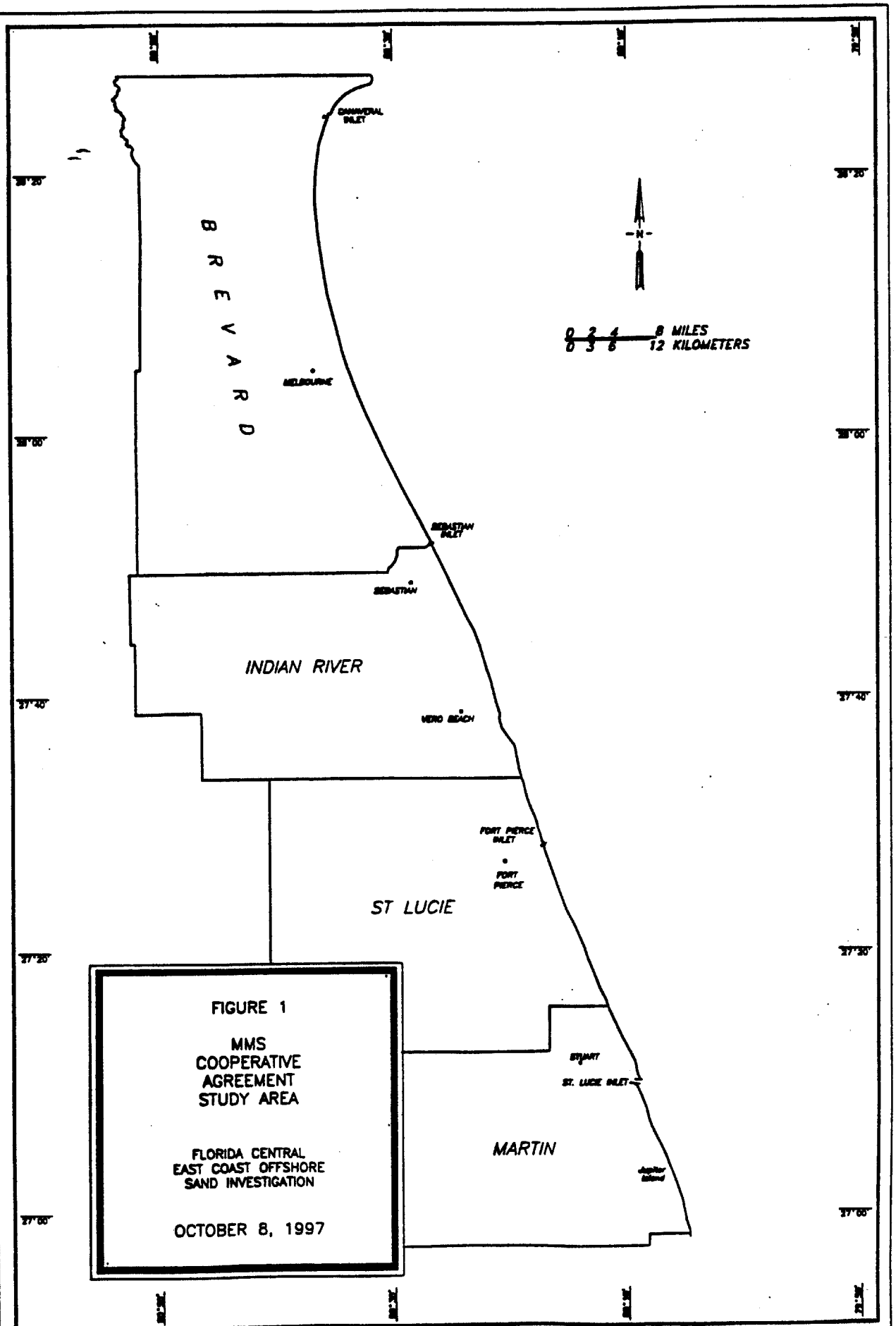
Hoenstine, R., H. Freedenberg, Z. Chen and H. Williams, 1995, A Geological Investigation of the Offshore Area Along Florida's Central East Coast-Annual Report to the MMS-Year 1: Florida Geological Survey, Tallahassee, Florida, 99 p.



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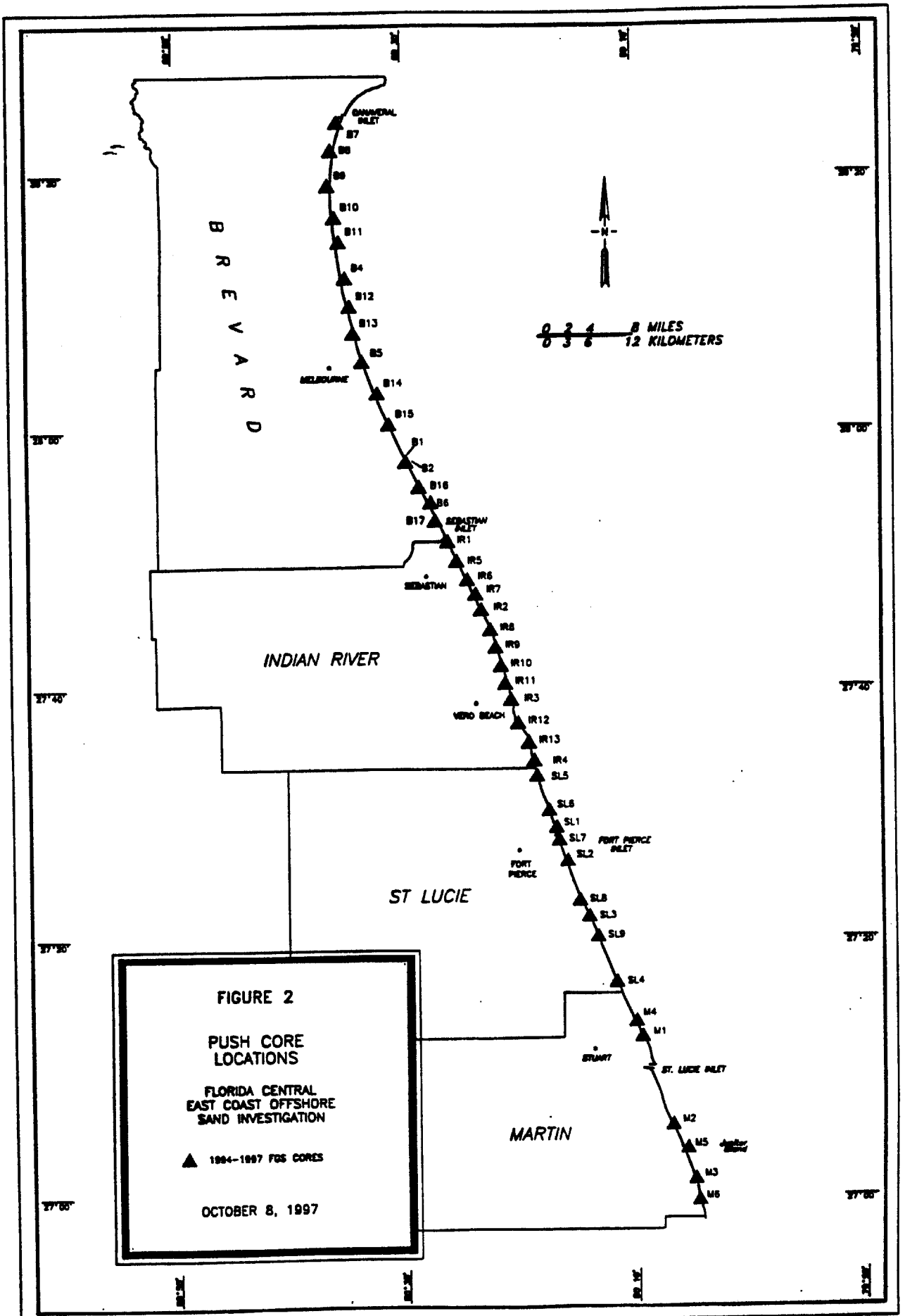

FIGURE 2

PUSH CORE LOCATIONS

FLORIDA CENTRAL EAST COAST OFFSHORE SAND INVESTIGATION

▲ 1994-1997 FDS CORES

OCTOBER 8, 1997

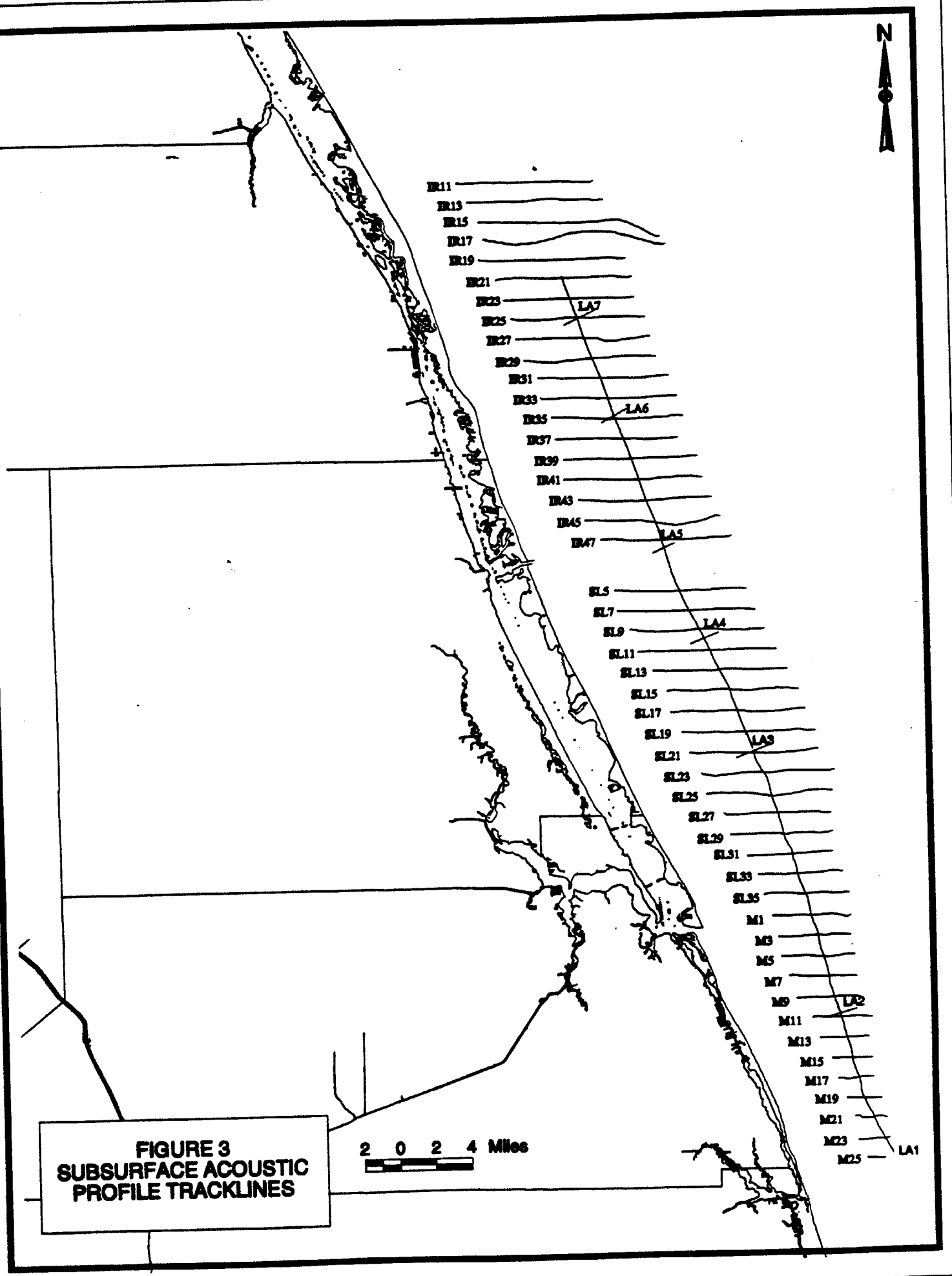

FIGURE 3
SUBSURFACE ACOUSTIC PROFILE TRACKLINES

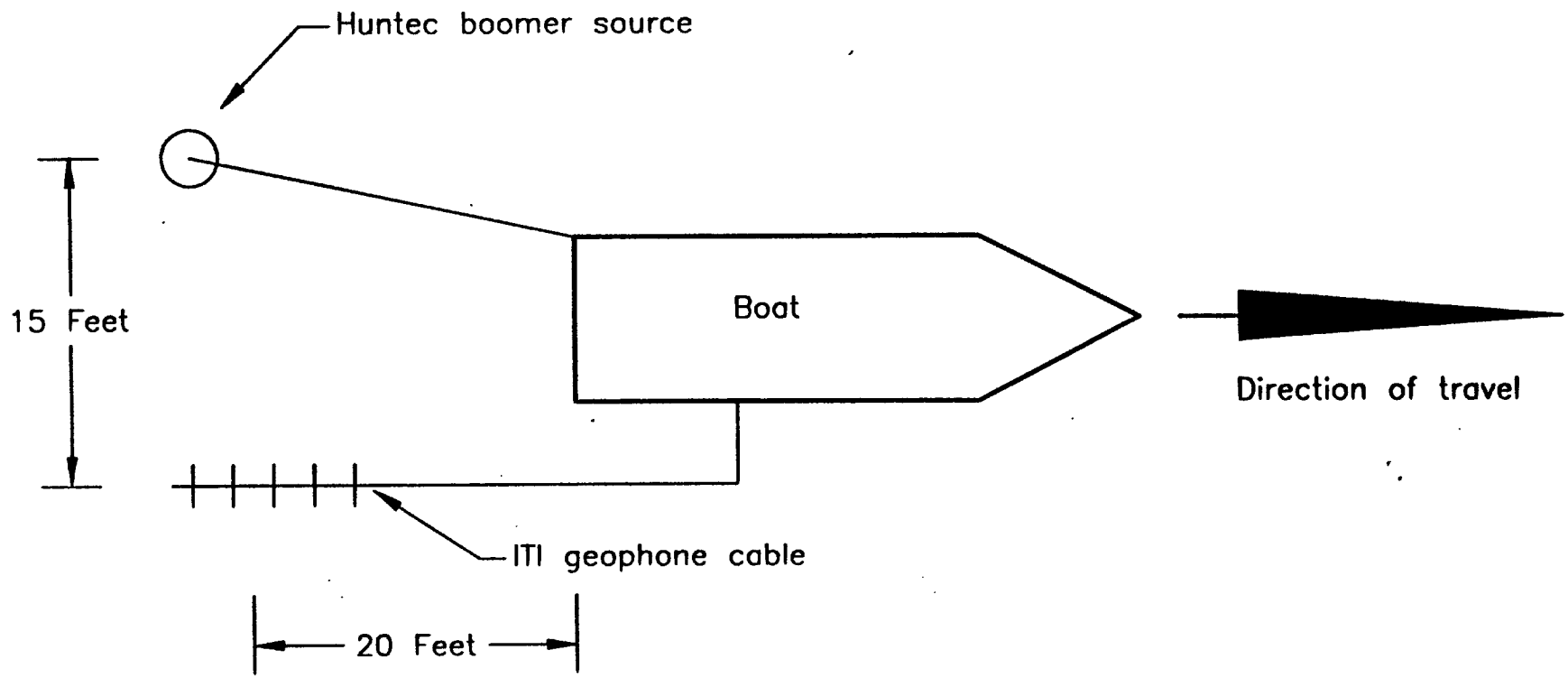

Figure 4 – SHOOTING GEOMETRY

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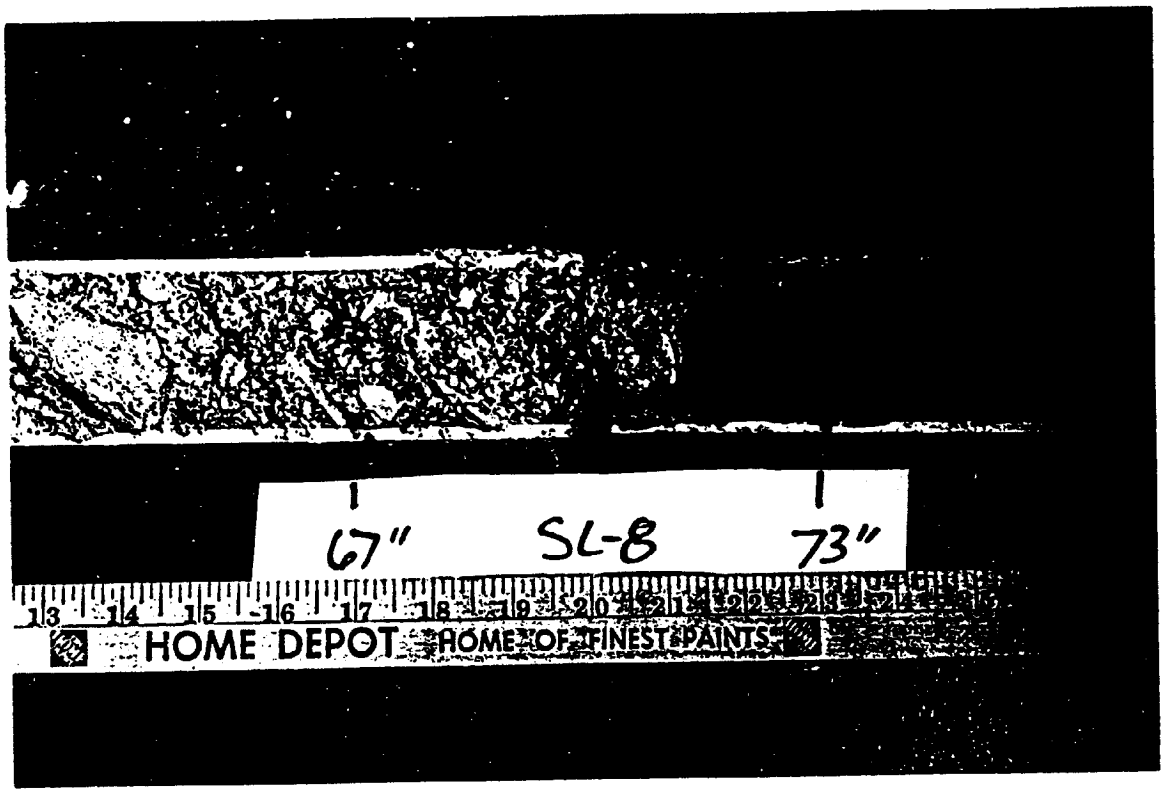
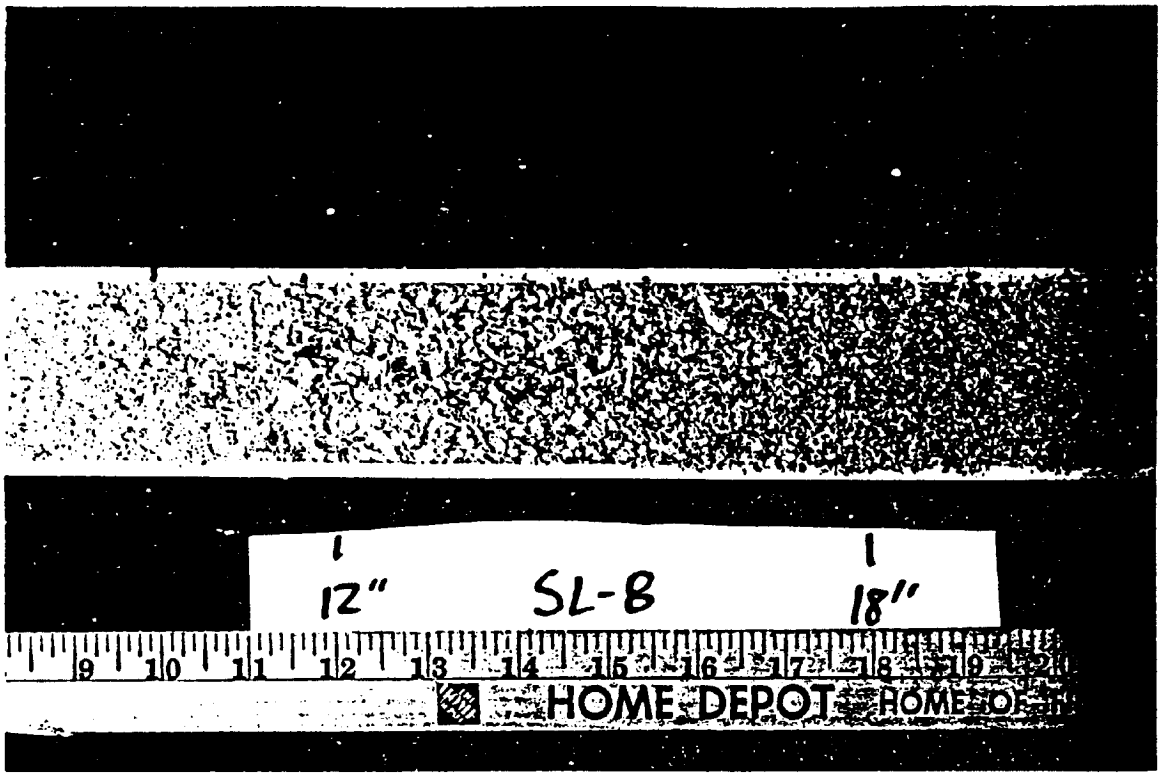
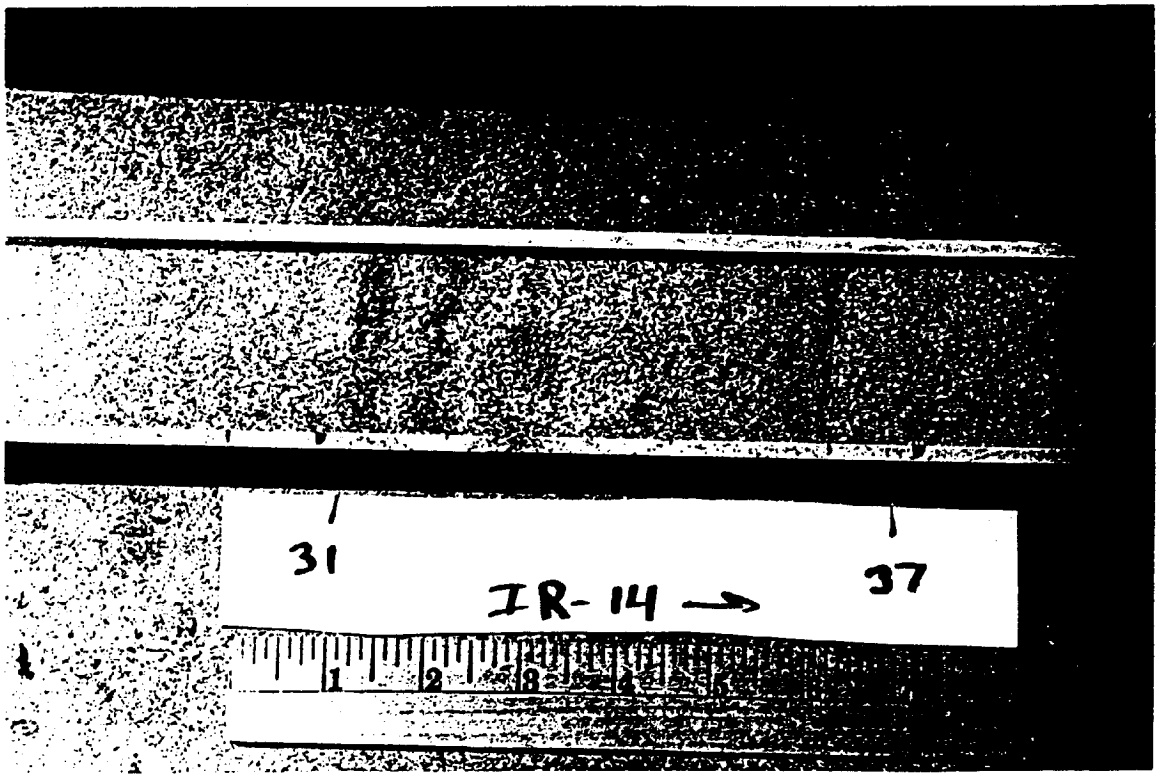
Fig. 5 Push Core Photographs



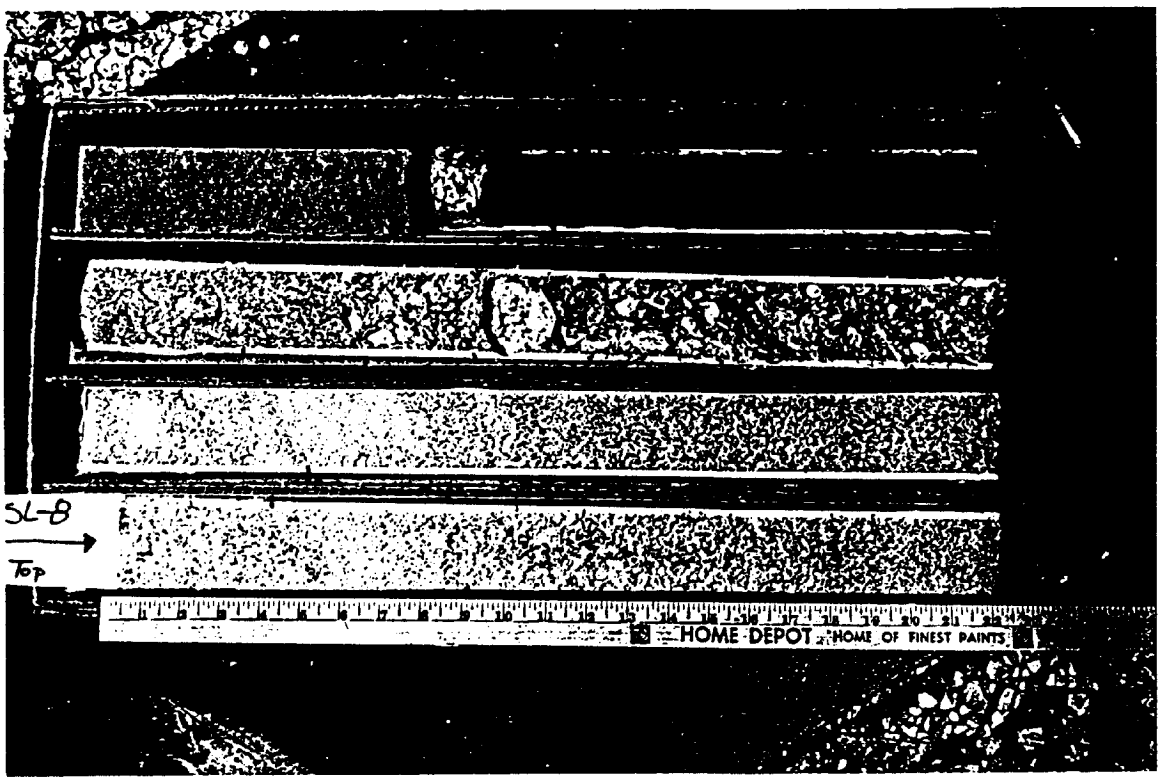
Photograph of SL-8 showing large shell fragments and basal peat layer. The peat layer is indicative of a low energy lagoonal reducing environment.



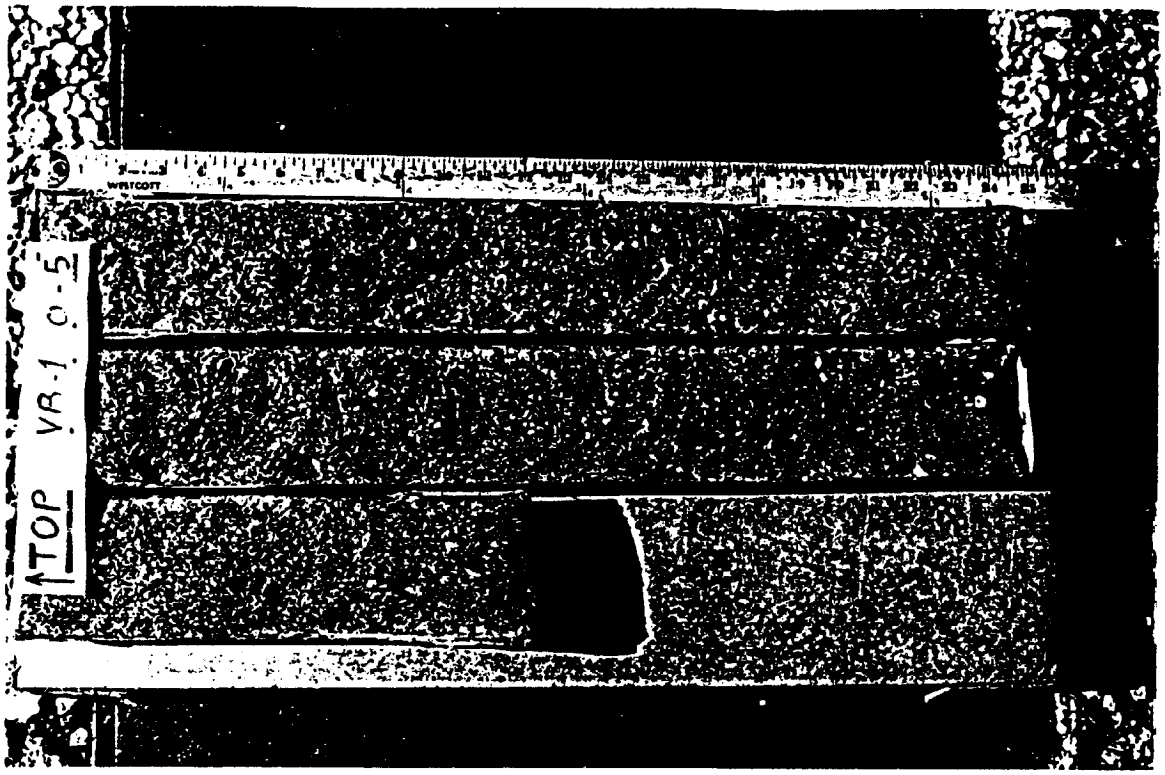
Photograph of SL-8 showing gradational sorting with numerous shell fragments



Photograph of IR-14 showing heavy mineral banding in well sorted sands.



Photograph of SL-8 showing fine-medium grained sands at surface grading into coarse shell fragments (possible representing storm overwash deposit) which is underlain in turn by peat.



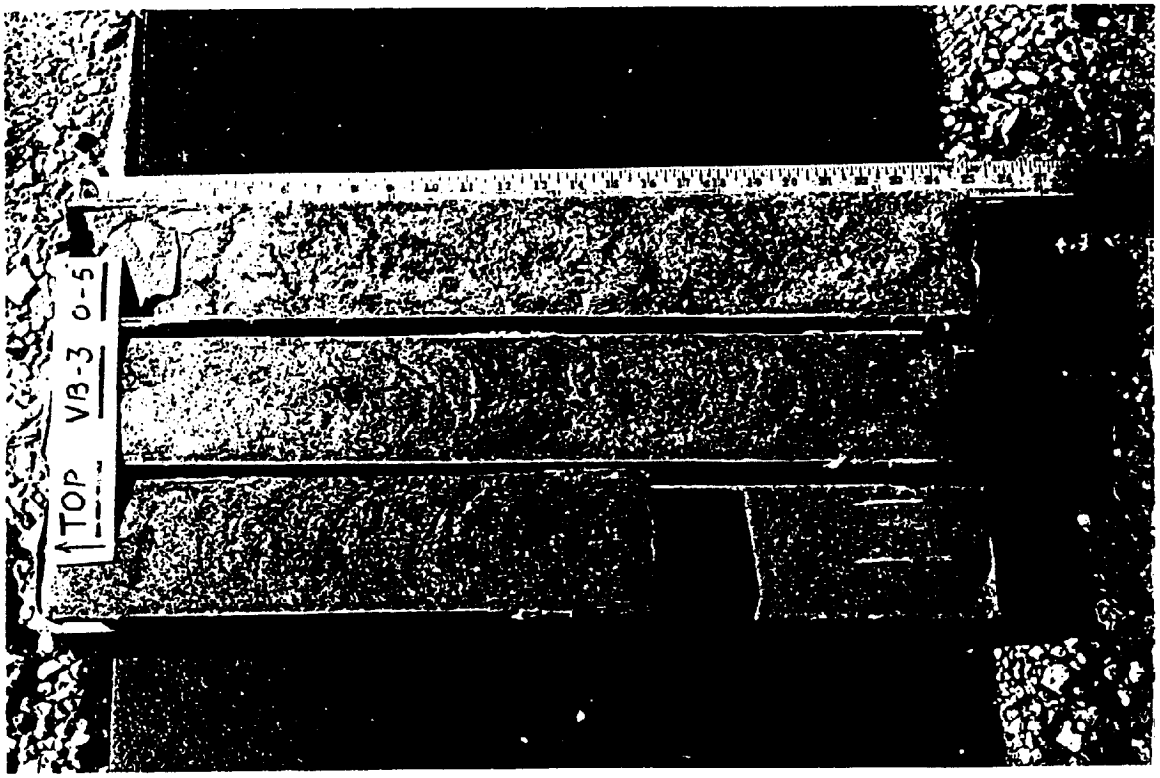


Figure 6 Vibracore Photographs

Photographs of uppermost 5 feet of vibracores VB-VB-1 and VB-3. Sand is medium-fine grained. Abundant shell fragments. Circular marks are from saw used to open cores.

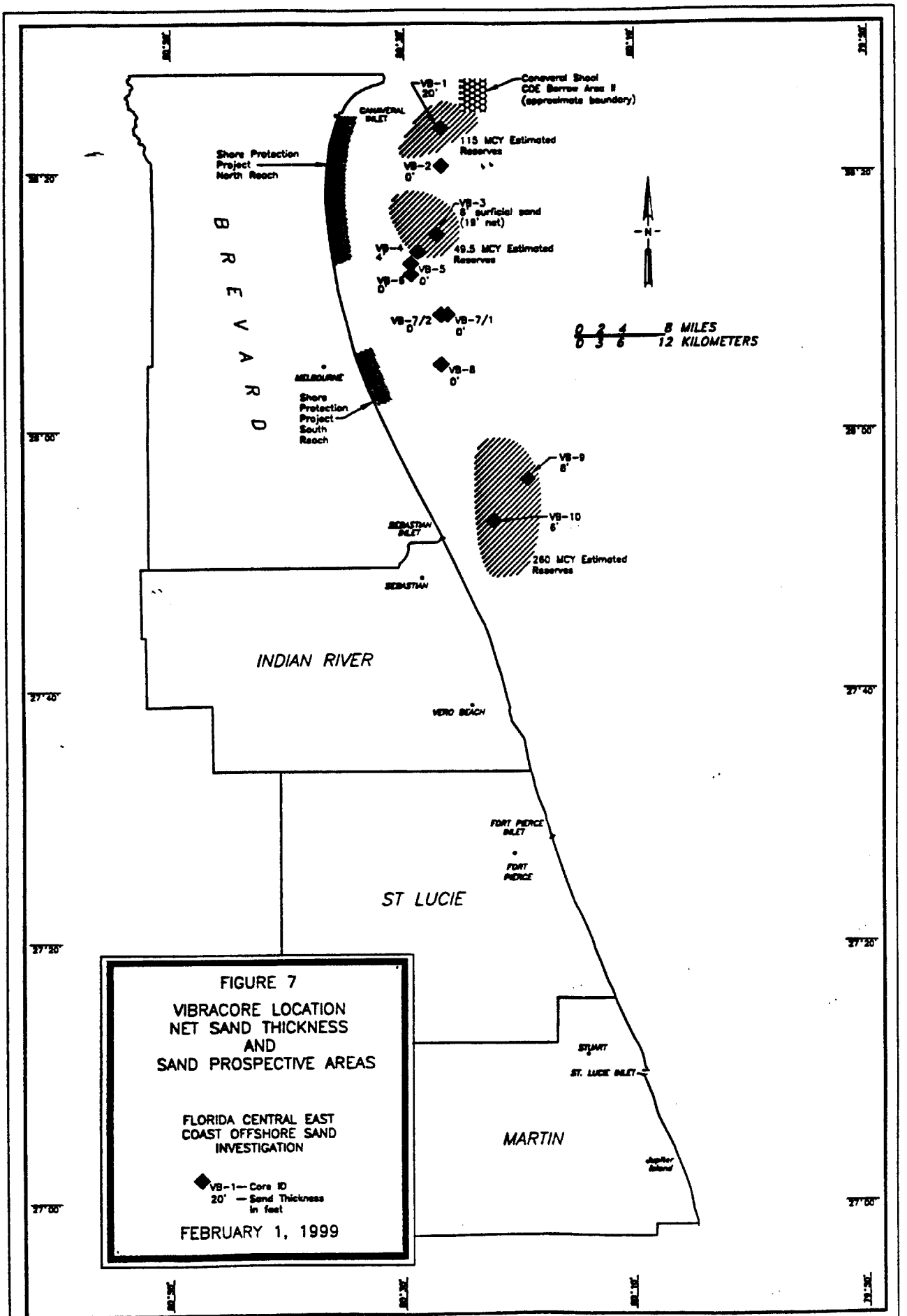


FIGURE 7

VIBRACORE LOCATION
NET SAND THICKNESS
AND
SAND PROSPECTIVE AREAS

FLORIDA CENTRAL EAST
COAST OFFSHORE SAND
INVESTIGATION

◆VB-1— Core ID
20' — Sand Thickness
in feet

FEBRUARY 1, 1999

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	TABLE 1 PUSH CORE LOCATIONS				
Core ID	Date Acquired	Lat	Long	D M' S"	D DM
B-1	11/28/94	27 52 22.3	80 30 07.5	X	
B-2	11/28/94	27 57 21.9	80 30 06.9	X	
B-3	11/29/94	See Notes			
B-4	11/29/94	28 11 39.2	80 35 39.2	X	
B-5	2/6/95	28 05 20.8	80 33 53.6	X	
B-6	2/6/95	27 54 05.7	80 28 12.2	X	
B-7	7/10/96	28 23.529	80 35.800	X	
B-8	7/10/96	28 20.270	80 36.463	X	
B-9	7/10/96	28 18.996	80 36.506	X	
B-10	7/15/96	See Notes			
B-11	7/16/96	28 11 17.4	80 35 34.8	X	
B-12	7/16/96	28 09 13.0	80 35 01.8	X	
B-13	7/16/96	28 06 53.5	80 34 24.1	X	
B-14	7/16/96	28 01 52.8	80 32 55.3	X	
B-15	7/17/96	27 59 17.2	80 31 05.5	X	
B-16	7/17/96	27 56 10.7	80 29 24.7	X	
B-17	7/17/96	27 51 55.5	80 27 03.2	X	
IR-1	1/5/95	27 51 05.2	80 26 36.0	X	
IR-2	1/5/95	27 45 48.4	80 23 49.5	X	
IR-3	1/5/95	27 48 41.0	80 21 09.1	X	
IR-4	1/5/95	27 33 40.8	80 19 21.5	X	
IR-5	2/11/97	27 49.643	80 25.803		X
IR-6	2/11/97	27 47.998	80 24.948		X
IR-7	2/11/97	27 46.411	80 24.078		X
IR-8	2/11/97	27 44.189	80 22.900		X
IR-9	2/11/97	27 42.693	80 22.410		X
IR-10	2/11/97	27 40.894	80 21.817		X
IR-11	2/11/97	27 38.995	80 21.248		X
IR-12	2/12/97	27 36.686	80 20.397		X
IR-13	2/12/97	27 34.905	80 19.643		X
IR-14	2/12/97	27 45.802	80 23.810		X
SL-1	1/5/95	27 28 29.3	80 17 26.7	X	
SL-2	1/6/95	27 26 13.2	80 16 44.3	X	
SL-3	1/6/95	27 21 44.2	80 14 42.2	X	
SL-4	1/6/95	27 16 30.2	80 12 20.2	X	
SL-5	6/10/98	27 33.060	80 19.170		X
SL-6	6/10/98	27 29.804	80 17.905		X
SL-7	6/10/98	27 27.582	80 17.242		X
SL-8	6/10/98	27 23.248	80 15.517		X
SL-9	6/10/98	27 19.197	80 13.540		X
M-1	1/5/95	27 12 21.3	80 10 07.9	X	
M-2	1/5/95	27 05 24.1	80 07 37.6	X	
M-3	1/5/95	27 01 14.1	80 05 43.4	X	
M-4	6/10/98	27 14.420	80 11.627	X	
M-5	6/11/98	27 03.153	80 06.508		X
M-6	6/11/98	26 59.593	80 05.596		X
Core B-3 was collected on KSC property and located on topo sheet					
GPS unavailable for Core B-10, core was located on topo sheet					
All GPS data reported as displayed. Last decimal shold be truncated.					

	Table 2 Vibracore Location and Net Restoration Sand Thickness						
Core ID	Date Collected	Lat	Long	Seismic Line ID	SP ID#	Sd Thickness	Seismic Character
VB-1	9/2/98	28 23 25.1280	80 26 43.5774	B-4	7750	20	Topo high associated w/Canaveral Shoal
VB-2	9/2/98	28 20 29.8362	80 26 43.5774	B-11	1200	N/A	Buried onlap sequence
VB-3	9/2/98	28 15 09.6096	80 27 04.1964	B-23	18900	8	Topo high w/buried onlap
VB-4	9/2/98	28 13 52.9026	80 28 46.4784	B-26	15600	4	Nr sfc amp anomaly on flank of topo high
VB-5	9/2/98	28 12 58.0956	80 29 19.8432	B-25	12200	N/A	Amplitude anomaly
VB-6	9/2/98	28 12 07.8366	80 29 19.7766	B-30	5700	N/A	Buried onlap w/pinchout close to sfc
VB-7/1	9/4/98	28 08 58.2816	80 26 15.5448	B-37	5425	N/A	Onlap pinchout
VB-7/2	9/4/98	28 08 57.9174	80 26 48.4284	B-37	6500	N/A	Onlap pinchout
VB-8	9/4/98	28 05 03.8886	80 26 48.4284	B-46	10900	N/A	Amplitude Anomaly
VB-9	9/4/98	27 56 07.4580	80 19 22.7016	B-68	21250	8	Nr sfc amp anomaly on flank of topo high
VB-10	9/4/98	27 52 54.0666	80 22 20.3598	B-76	5500	6	Amplitude anomaly
N/A- Not Applicable. No Restoration Quality Sand at Surface							
All Lat-Longs in D M' S"							